

<b>Office Action Summary</b>	<b>Application No.</b> 10/767,253	<b>Applicant(s)</b> SUZUKI ET AL.	
	<b>Examiner</b> Harry D. Wilkins, III	<b>Art Unit</b> 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 83-105 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 83-93,95 and 97-105 is/are rejected.
- 7) ☒ Claim(s) 94 and 96 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### Status

1. Due to the large number of rejection grounds presented in the previous office action, unless a rejection ground is specifically restated below, it should be considered withdrawn.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 83, 85-87, 89, 91-93, 95, 97-98, 100 and 102-105 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172) in view of Kunisawa et al (US 2002/0020627).

Hosten et al teach (see abstract, figures 1 and 2 and col. 3, line 58-col. 4, line 10 of '172 patent) an electrolytic processing apparatus including a substrate holder (5) for holding a substrate (3), a first electrode (4) for contacting the substrate to supply current

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to a surface to be processed of the substrate, a second electrode (6, 14) disposed substantially parallel to the surface of the substrate in a position facing the surface, an electrolytic solution injecting part (7) which injected the electrolyte from a position lateral of the substrate and a power source (not shown).

Hosten et al fail to teach (a) supporting the substrate in a face-up position and (b) a resistance structure interposed between the second electrode and the substrate.

Kunisawa et al teach (see abstract, figures 39-41, and paragraphs 245-253) that placement of a high resistance structure, a plate made of porous alumina, between the anode and a substrate creates an overall leveling effect for the current density at the substrate surface, thereby increasing the uniformity of the electroplated layer in terms of thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the high resistance structure taught by Kunisawa et al to the apparatus of Hosten et al for the purpose of increasing uniformity of the electroplated layer thickness.

In addition, Kunisawa et al show that (see paragraphs 234, 312 and 319) that both face-up and face-down processing of workpieces was known in the art of electroplating, and that it was within the ability of one of ordinary skill in the art to adapt an apparatus for either face-up or face-down processing as desired. Further, although the drawings of Hosten et al show face-down processing, the specification provides no teaching relating to the substrate being face-up or face-down, such that Hosten et al does not teach away from either option.

Thus, it would have been obvious to one of ordinary skill in the art to have adapted the apparatus of Hosten et al to process the substrate in a face-up position as suggested by Kunisawa et al and shown to be within the ability of one of ordinary skill in the art by Kunisawa et al.

Regarding claim 98, Hosten et al teach both an introducing portion and a withdrawing portion, each of them arranged lateral of the substrate. Since the resistance structure of Kunisawa et al was placed between the second electrode and the substrate, the introducing and withdrawing portions would have also been positioned lateral of the resistance structure.

Regarding claims 85 and 100, there is an electrode holder which held the second electrode of Hosten et al. In view of the teachings of Kunisawa et al, the resistance structure would also have been held by the electrode holder. The introducing portion was disposed lateral the electrode holder.

Regarding claims 86 and 87, since the claims do not explicitly define the structure required to form an air ejecting portion and an air drawing portion, a device having the region between the substrate and the second electrode/high resistance structure open to atmosphere would have been capable of ejecting air into and withdrawing air out of the region. The structure of Hosten et al in view of Kunisawa et al meets this feature.

Regarding claim 89, the structure of Hosten et al in view of Kunisawa et al meet these limitations because the electrode holder was held in a horizontal orientation and was vertically movable.

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Regarding claims 91 and 102, the distal end of the solution introducing portion was formed as a nozzle.

Regarding claims 92 and 103, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 12, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electroplating cell.

Regarding claims 93 and 104, the introducing and withdrawing portions of Hosten et al extending along a circumferential direction of a peripheral edge of the substrate.

Regarding claim 95, the substrate holder of Hosten et al was rotatable and the introducing portion functioned as claimed.

Regarding claim 97, the introducing portion of Hosten et al was capable of injecting electrolyte at a desired speed, and, thus, meets the structural limitations of this claim.

Regarding claim 105, the introducing portion and the withdrawing portion faced each other across the substrate.

5. Claims 90 and 101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosten et al (WO 01/12882, with reference to its English equivalent US 6,949,172) in view of Kunisawa et al (US 2002/0020627) as applied to claims 83 and 98 above, and further in view of Dordi et al (US 2001/0052465).

The teachings of Hosten et al and Kunisawa et al are disclosed above.

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Neither of Hosten et al and Kunisawa et al teach including a deaerating device in the electrolyte flow system.

However, Dordi et al teach (see figures 26A and 26B and paragraphs 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Hosten et al and Kunisawa et al for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

6. Claims 83-84, 86-89, 91-93, 95, 97-99 and 102-105 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisawa et al (US 2002/0020627) in view of Reynolds (US 5,597,460).

Kunisawa et al teach (see e.g.-figures 28, 30, 39, 40, 42, etc.) an electroplating apparatus including a substrate holder, a first electrode for contacting a surface of the substrate to be plated, a second electrode positioned substantially parallel to the substrate, a high resistance structure disposed between the substrate and second electrode, a power source and an electrolyte introduction portion.

However, the electrolyte introduction portion did not introduce electrolyte from lateral of the high resistance structure.

Reynolds teaches (see abstract, figures 1-3 and col. 3) that highly uniform electroplating can be performed by instituting a flow regime such that the electrolyte

passes only in one direction across the substrate surface with a uniform flow profile across the width of the substrate surface.

Therefore, it would have been obvious to one of ordinary skill in the art to have instituted an across-face electrolyte flow scheme as taught by Reynolds within the apparatus of Kunisawa et al by permitting the electrolyte to flow from a position lateral of the substrate/second electrode/high resistance structure in order to permit more uniform electroplating to occur, as suggested by Reynolds.

Regarding claim 98, the structure of Reynolds also included an electrolytic solution withdrawing portion arranged lateral of the substrate.

Regarding claims 84 and 99, Reynolds teaches (see figure 3) forming the introducing portion integral with the electrode holder, which holds the electrode (26) and the high resistance structure (20). Kunisawa et al also teach (see figure 28) forming the introducing portion integral with the electrode holder.

Regarding claims 86 and 87, since the claims do not explicitly define the structure required to form an air ejecting portion and an air drawing portion, a device having the region between the substrate and the second electrode/high resistance structure open to atmosphere would have been capable of ejecting air into and withdrawing air out of the region.

Regarding claims 88 and 89, Kunisawa et al teach (see paragraph 212) that the high resistance structure was capable of vertical and/or tilting motion. Thus, the structure of Kunisawa et al and Reynolds was capable of operating in the claimed fashion.

Regarding claims 91 and 102, the ends of the introduction portion (46) were formed as nozzles.

Regarding claims 92 and 103, it would have been obvious to one of ordinary skill in the art to have put a check valve in the introducing section, such as in pipe 104, to ensure that flow of electrolyte always proceeded in the desired direction and to prevent electrolyte from flow backwards through the electroplating cell.

Regarding claims 93 and 104, the introduction and removing portions of the apparatus of Reynolds included portions disposed in positions disposed along a circumferential direction of a peripheral edge of the substrate (see esp. figure 3).

Regarding claim 95, the substrate holders of both Kunisawa et al and Reynolds were rotatable and the introducing portion functioned as claimed.

Regarding claim 97, the apparatus of Kunisawa et al in view of Reynolds would have been capable of operating in the claimed fashion since it provided linear flow from one peripheral edge to the opposite peripheral edge of the substrate.

Regarding claim 105, the introducing portion and the withdrawing portion faced each other across the substrate (see esp. figure 3)

7. Claims 90 and 101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisawa et al (US 2002/0020627) in view of Reynolds (US 5,597,460) as applied to claims 83 and 98 above, and further in view of Dordi et al (US 2001/0052465).

The teachings of Kunisawa et al and Reynolds are disclosed above.

Neither of Kunisawa et al and Reynolds teach including a deaerating device in the electrolyte flow system.



However, Dordi et al teach (see figures 26A and 26B and paragraphs 123-124) that degasser modules were included in electrolyte recirculation loops for the purpose of removing entrained gas, which could form bubbles within the electroplating cell, thereby increasing electroplating uniformity by preventing the formation of bubbles.

Therefore, it would have been obvious to one of ordinary skill in the art to have added the degasser modules taught by Dordi et al to the apparatus of Kunisawa et al and Reynolds for the purpose of preventing bubbles from forming within the electroplating cell, to thereby enhance electroplating uniformity.

***Allowable Subject Matter***

8. Claims 94 and 96 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach, or provide adequate motivation to arrive at, a structure having all of the structural configurations/limitations of these claims.

***Response to Arguments***

10. Applicant's arguments with respect to claims 83-105 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

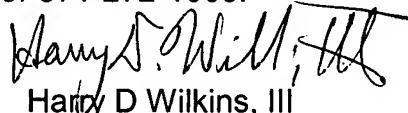
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 7:45am-4:15pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Harry D Wilkins, III  
Primary Examiner  
Art Unit 1753

hdw